

INTEX-B & MILAGRO: Airborne observations and satellite validation in 2006

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(White paper <http://cloud1.arc.nasa.gov>)

GOAL: To understand the transport, transformation, & impacts of gases & aerosols on air quality & climate from local to global scales

- INTEX-A: Summer 2004
 - large biosphere emissions
 - active photochemistry
- INTEX-B: Spring 2006
 - maximum Asian inflow to NA
 - seasonal contrast

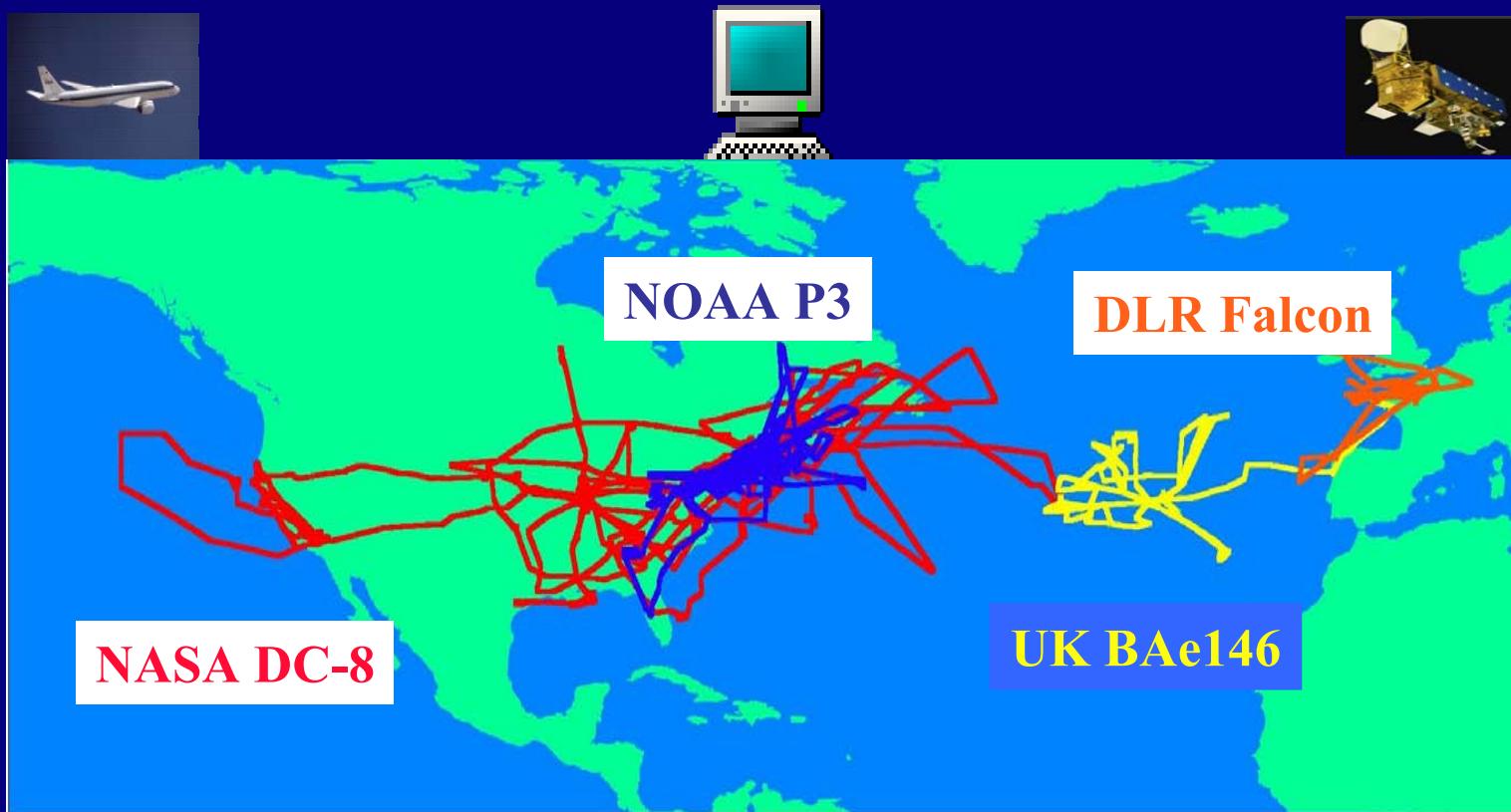
MILAGRO



INTEX-B

Partners: NASA, NSF, DOE, DLR, Mex

INTEX-A Plan & Coordination

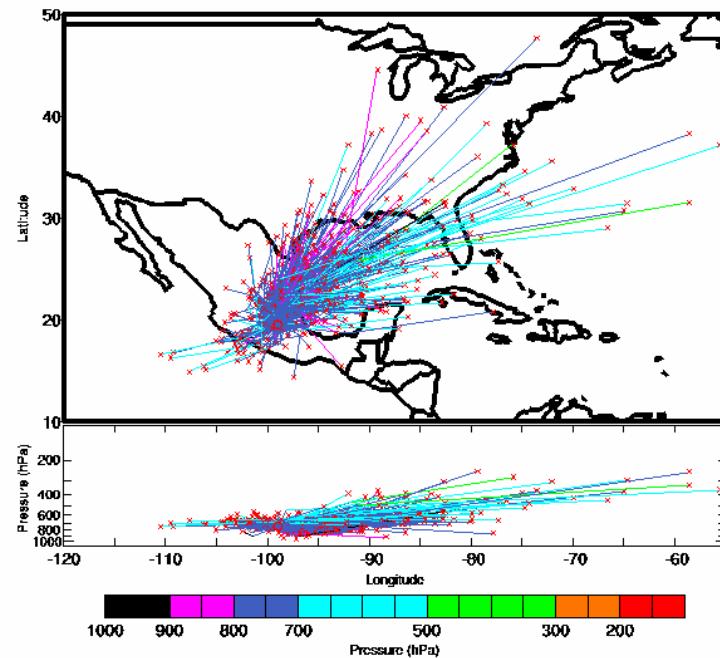


- Inter-comparisons
- Coordinated Science flights
- Sharing of forecasts & data
- Joint publications

INTEX-B/MILAGRO SCIENTIFIC GOALS

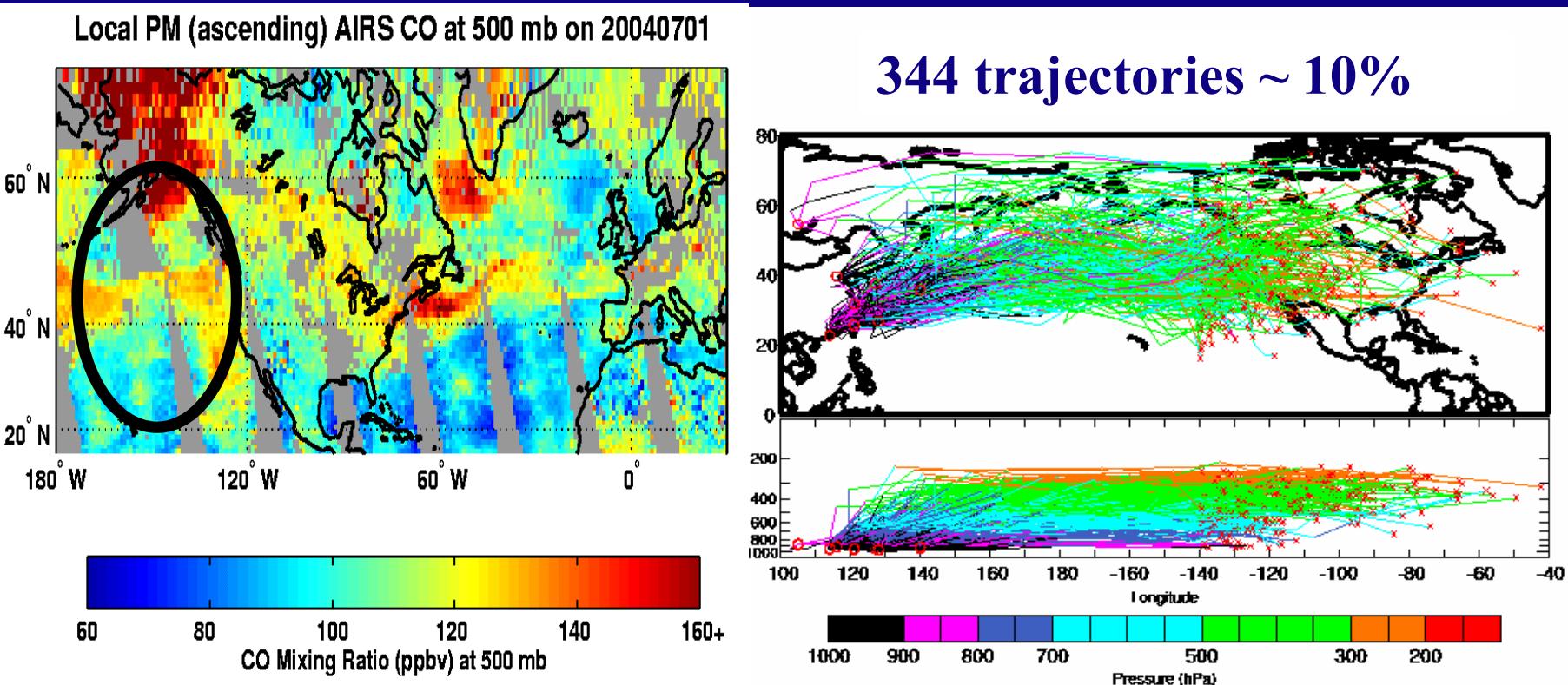
- Transport & evolution of Asian pollution to NA and beyond & implications for regional air quality & climate
- Extent, persistence, & transformation of Mexico City pollution plumes
- Validation of satellite observations of tropospheric composition
- Mapping of anthropogenic and biogenic emissions
- Relating atmospheric composition to sources and sinks

Mexico City Pollution & 3-Day Forward Trajectories



March Data for 15 years; 33% over US

7-day Forward Asian Trajectories (past 140W)



O₃ trend of 0.5 ppb/yr

One Trajectory per day released from
500 meters AGL from 8 Asian cities.
April data 15 years

Main INTEX-B Airborne Platforms

NASA DC-8



NSF C-130



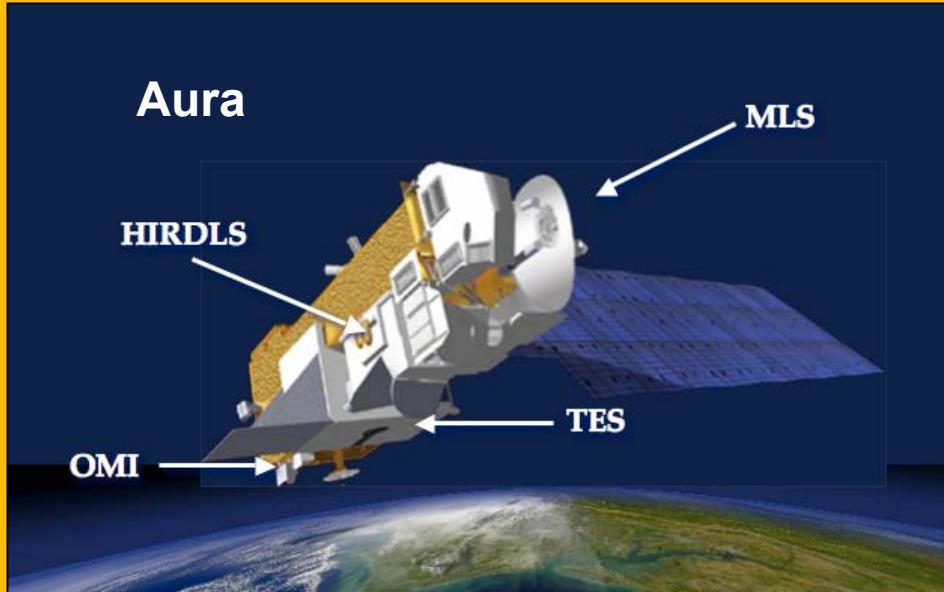
DLR FALCON



DOE G1

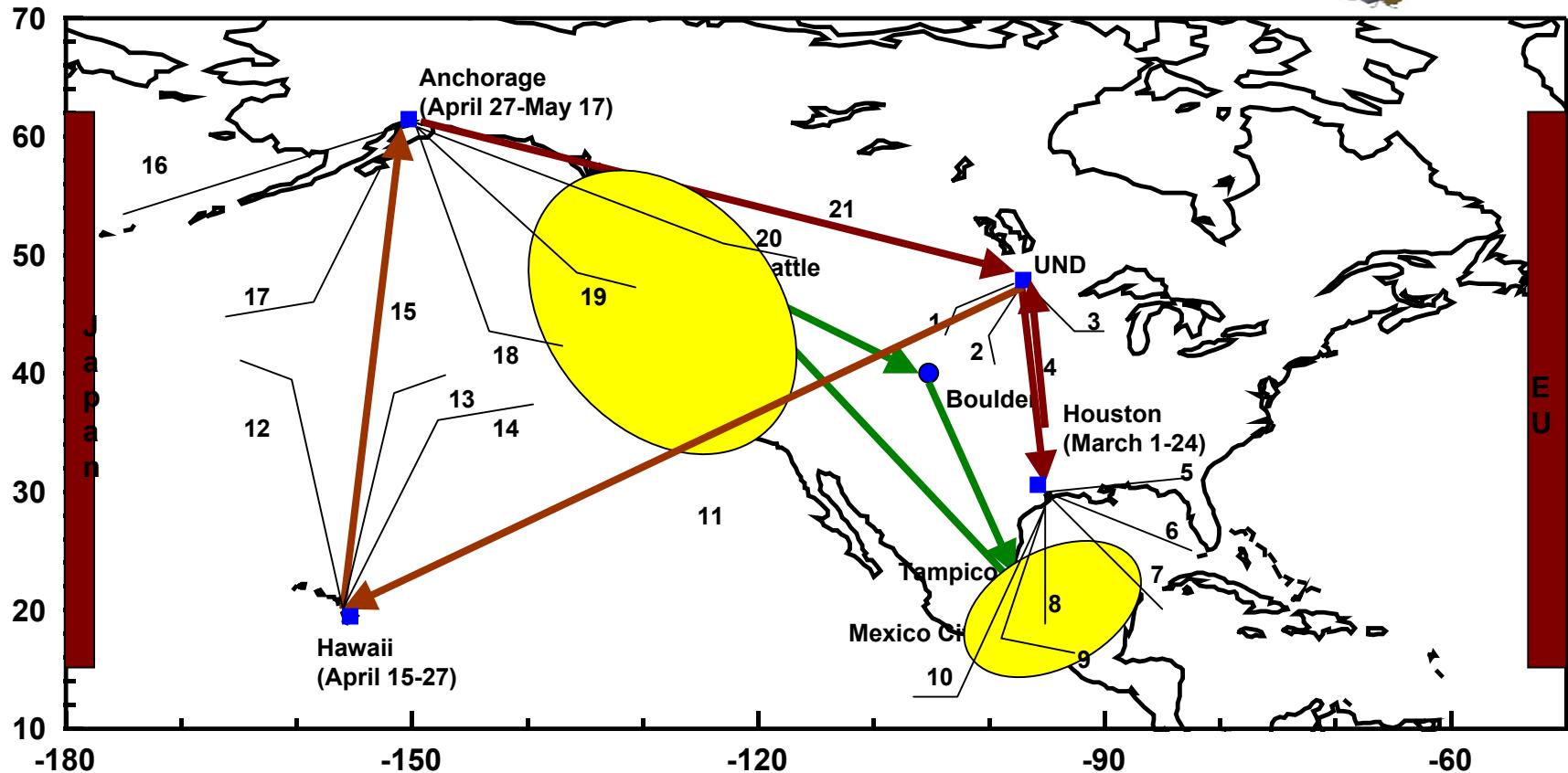
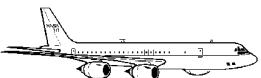


Satellites



Satellite Platform*	Instruments	Some key data products	Vert. resol.
Aura: http://eos-aura.gsfc.nasa.gov/	TES OMI MLS	CO, CH ₄ , O ₃ , HNO ₃ , NO ₂ O ₃ , NO ₂ , SO ₂ , HCHO H ₂ O, HCN, CO	Trop col./4 kn Trop column UT/LS
Aqua: http://eos-pm.gsfc.nasa.gov/	MODIS AIRS	Aerosol optical depth CO	Trop column Trop col./4 kn
Terra: http://eos-am.gsfc.nasa.gov/	MOPITT MISR MODIS	CO Aerosol optical depth Aerosol optical depth	Trop col./4 kn Trop column Trop column
Envisat: http://envisat.esa.int/	SCIAMACHY MIPAS	O ₃ , NO ₂ , CH ₂ O Trace organics	Trop column UT/LS
Calipso: http://www.calipso.larc.nasa.gov/	CALIOP	Aerosol distribution	High resolution

INTEX-B/MILAGRO Grand Plan for Spring 2006



Down period: 25 Mar-10 Apr

Nominal C-130 operations

Operations of foreign partners (DLR/Falcon-20)

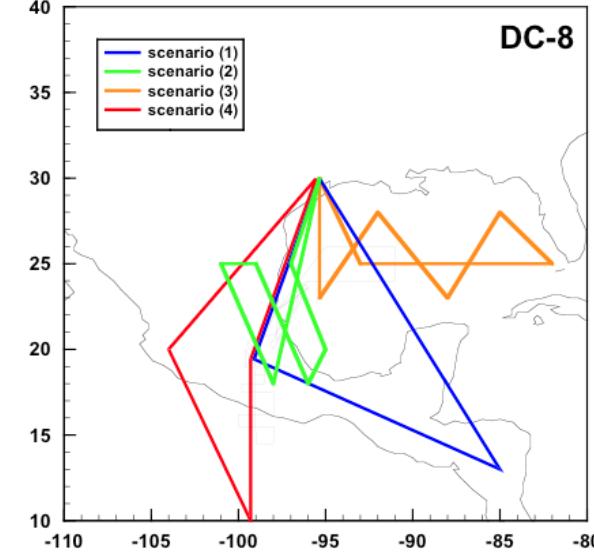
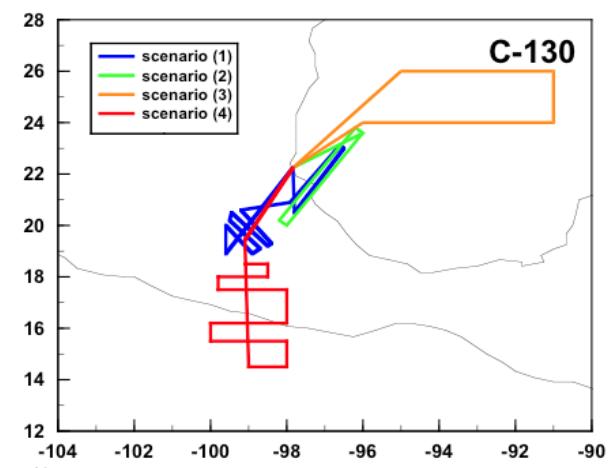
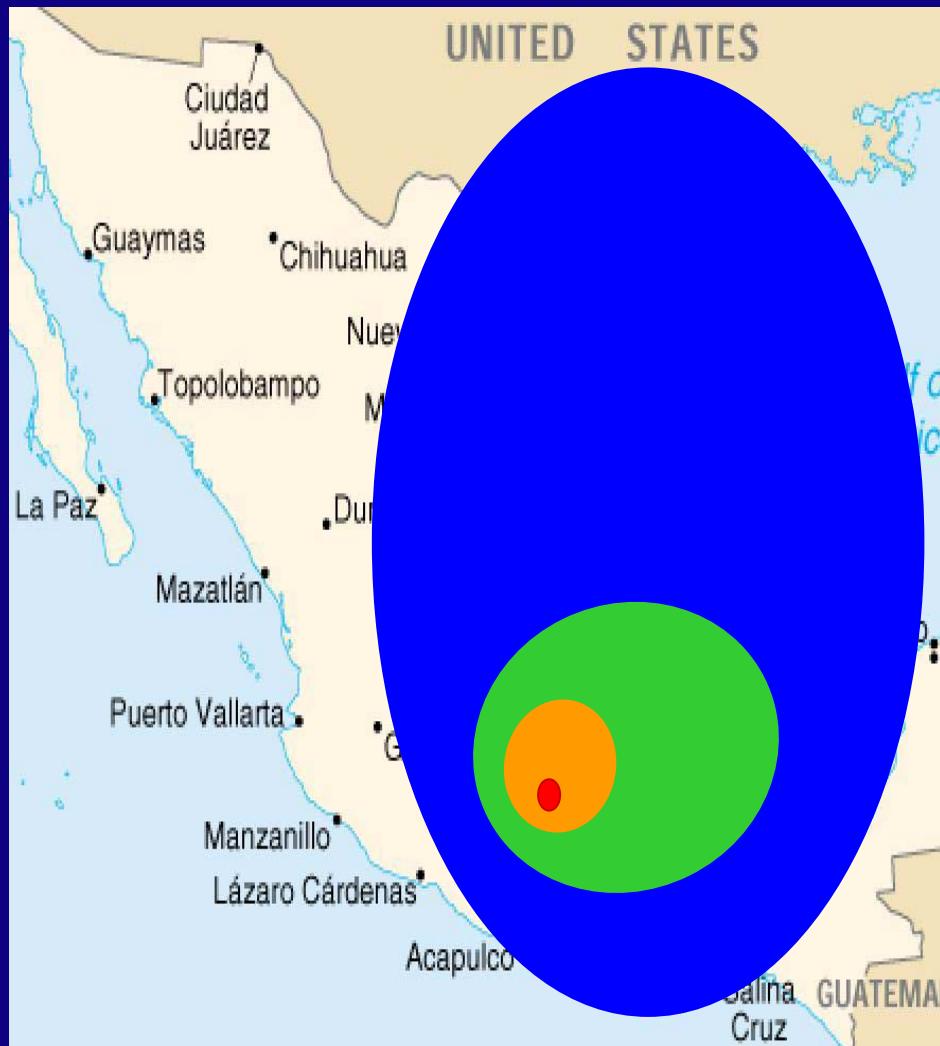
DC-8 transits →

C-130 transits →

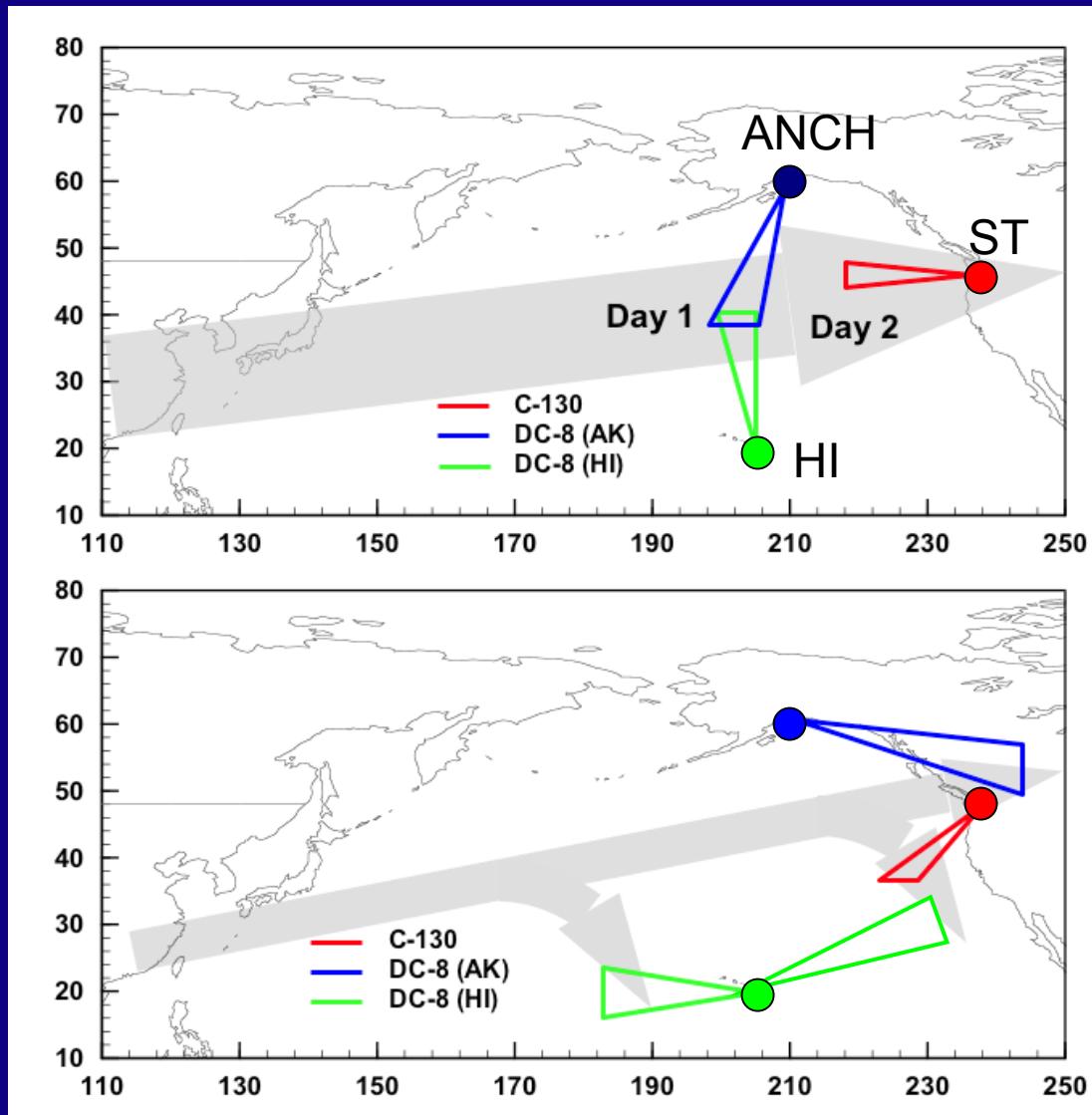
DC-8 locals —————

21 flights (180 flight hours):
UND (3 test flights)
Houston (6 local flights)
Hawaii (3 local flights)
Anchorage (5 local flights)
4 transit flights

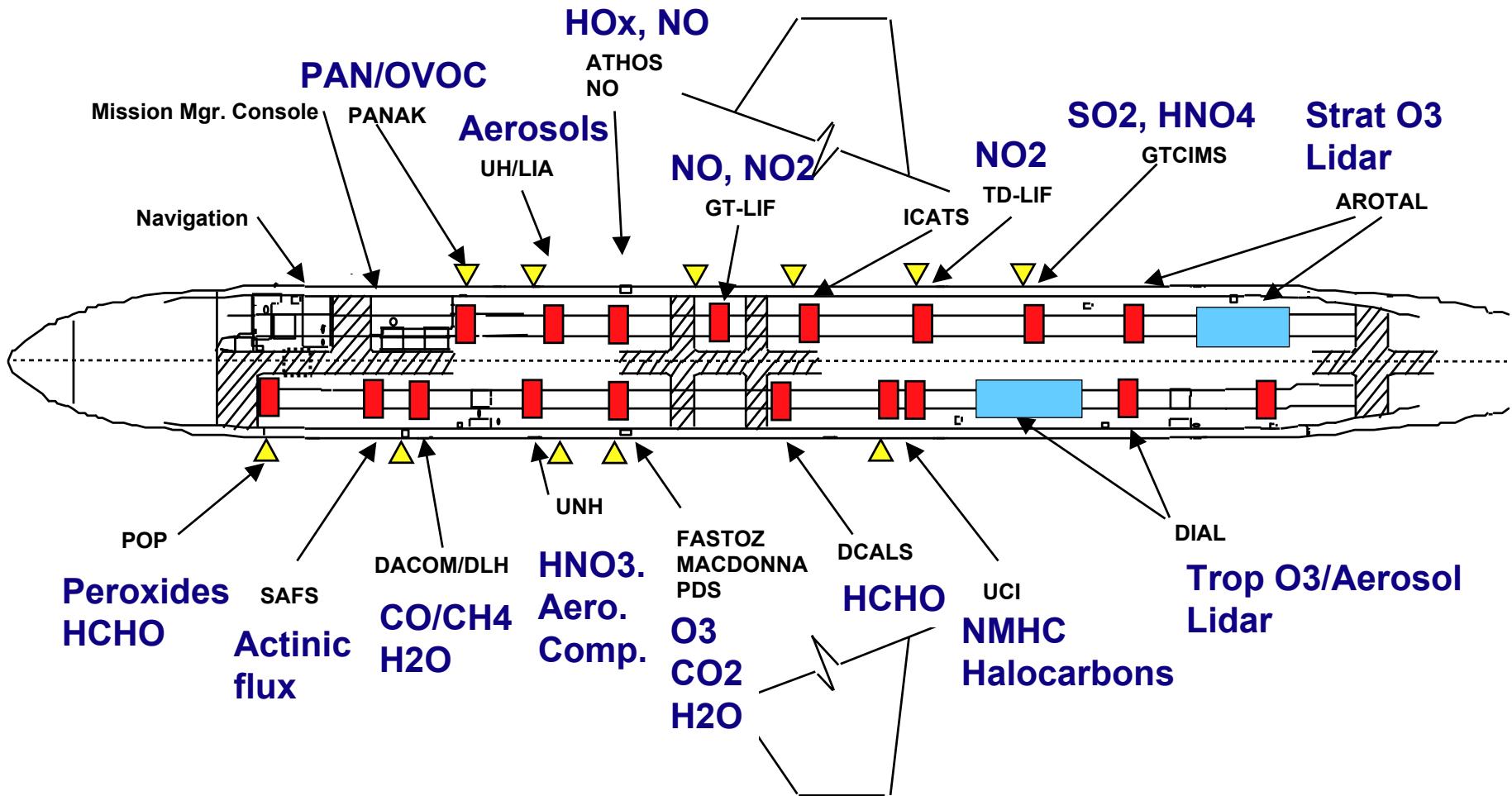
DC-8 & C-130 Coordination in INTEX-B/Part 1



DC-8 & C-130 Coordination in INTEX-B/Part 2



DC-8 INTEX-B Payload

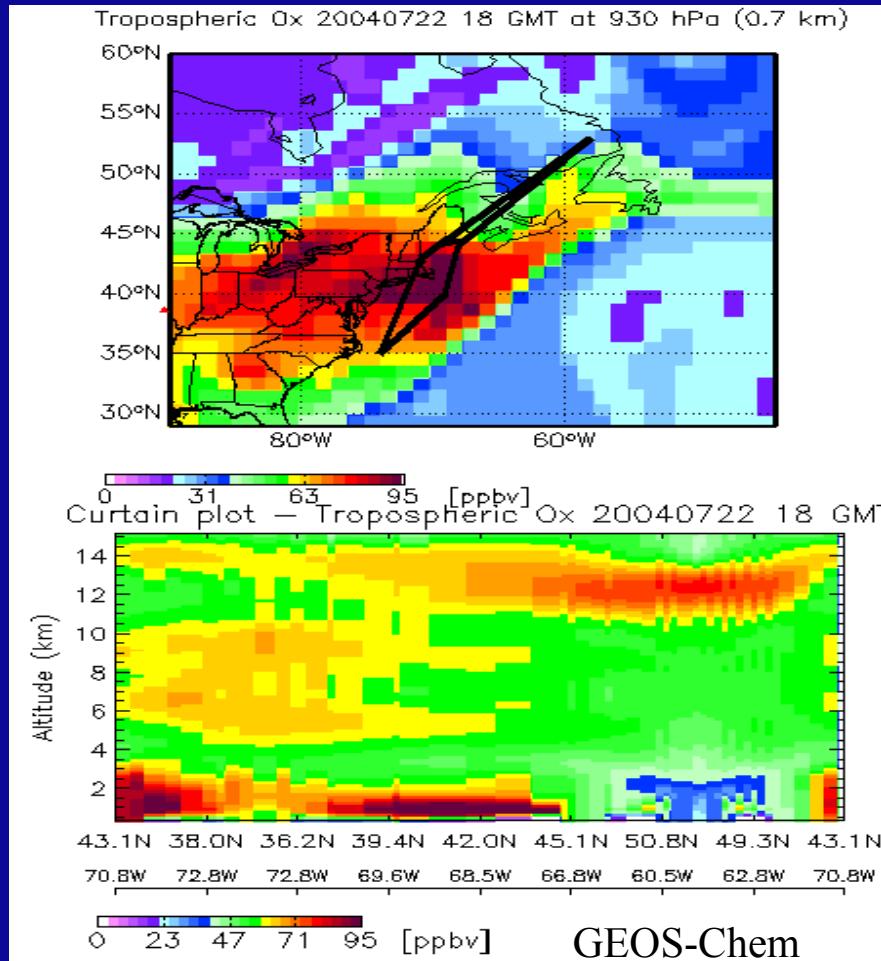


EQUIPMENT RACK

LASER SYSTEM

PROBE

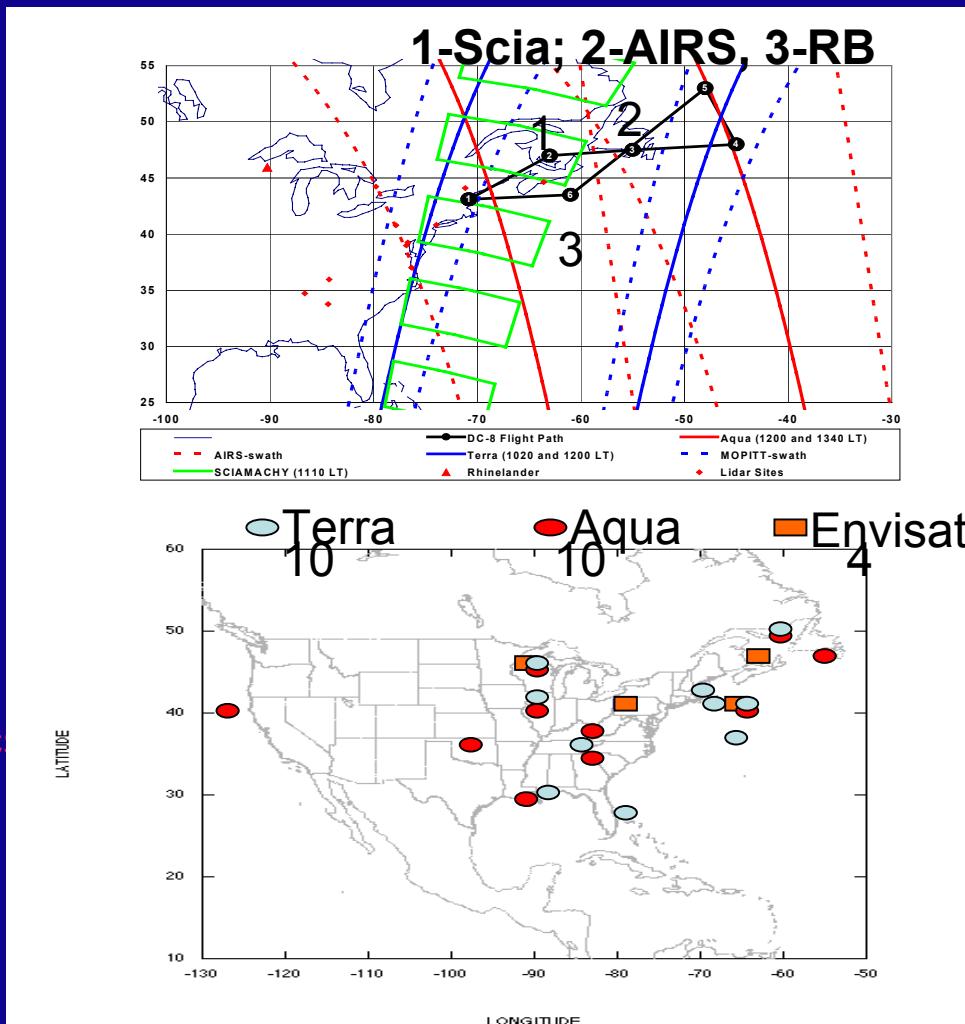
Forecast Products



INTEX-A DC-8 Satellite Validations

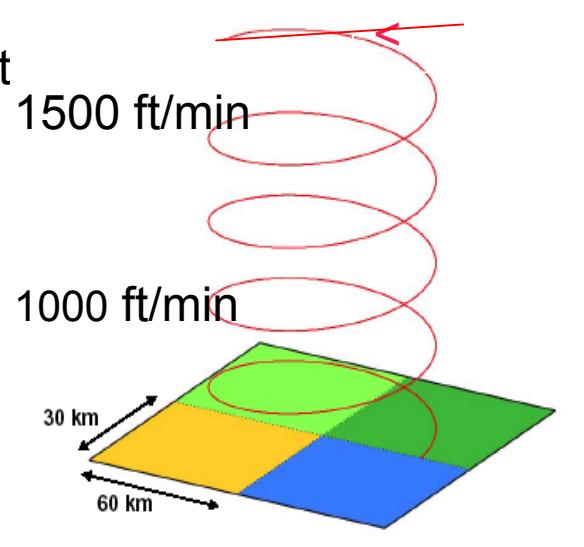
(MOPITT, MISR, AIRS, SCIAMACHY)

CO
HCHO
NO₂
SO₂
H₂O
HCN
O₃
Aerosol
Organic

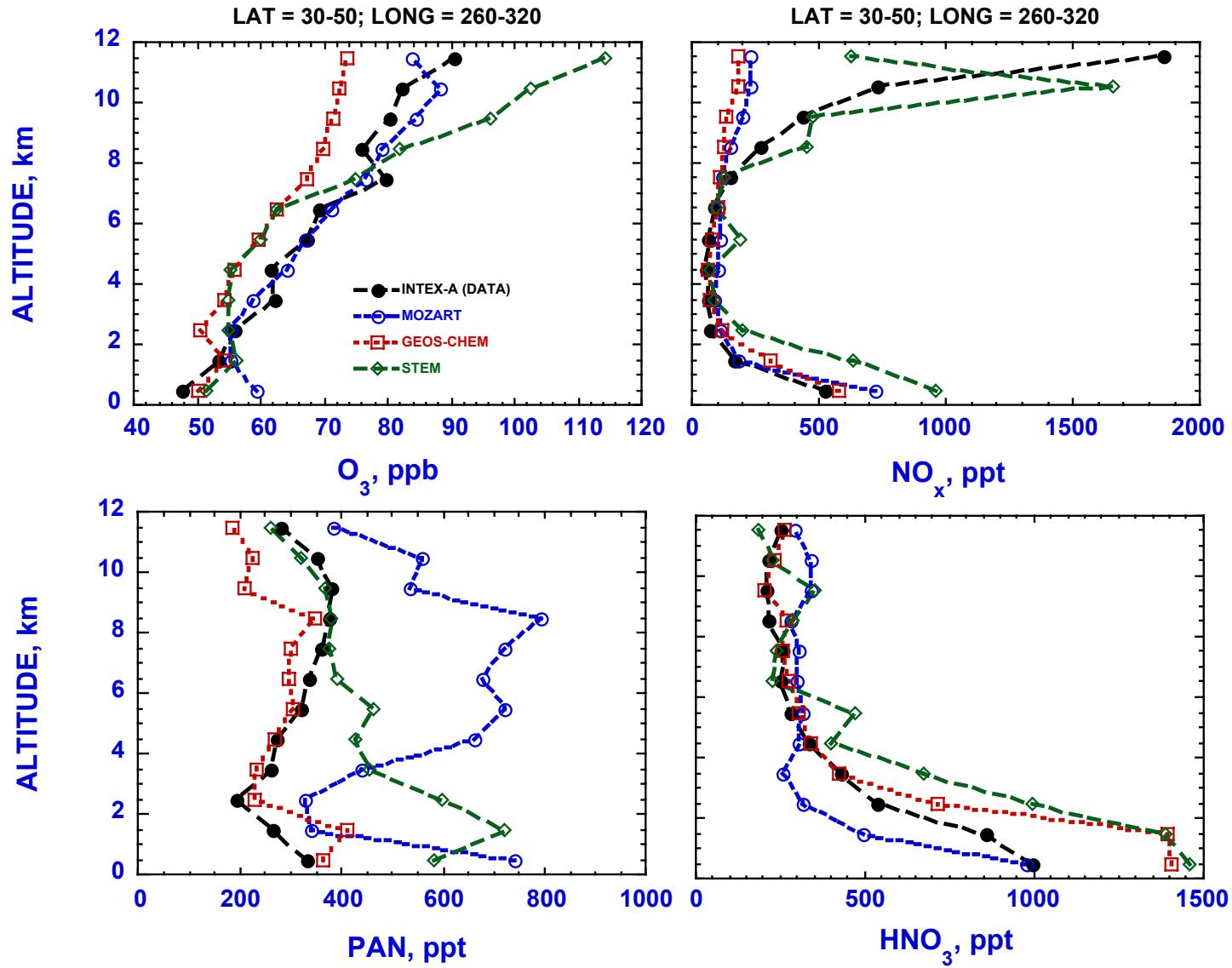


Profiles:

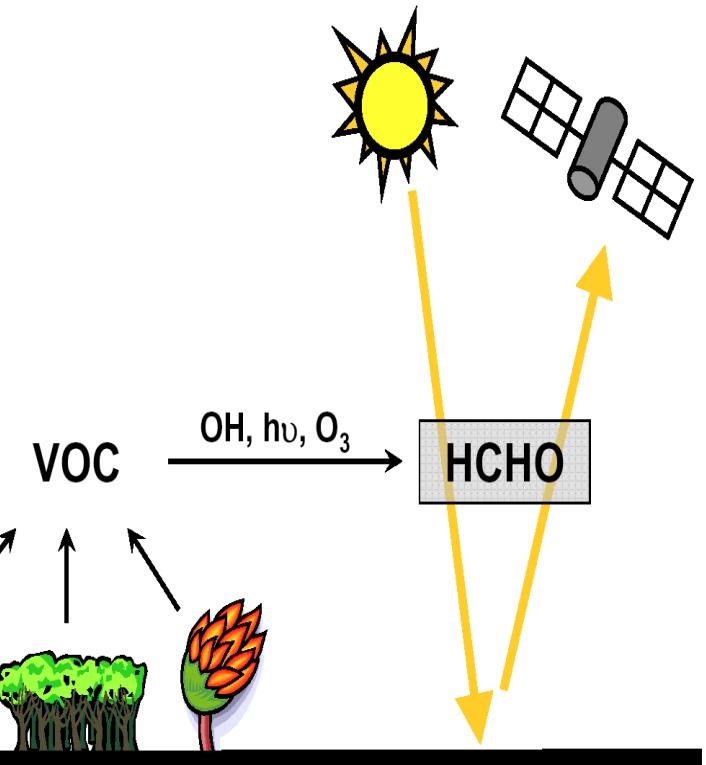
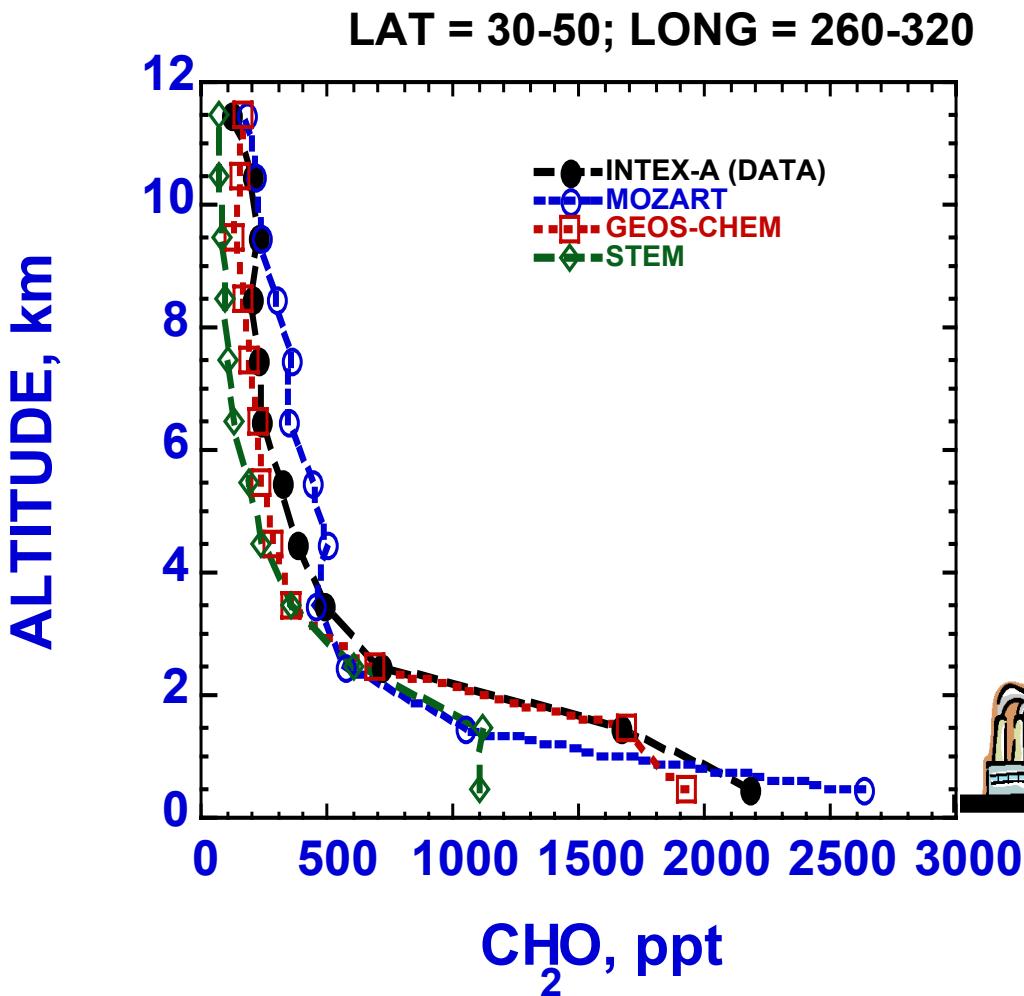
- to 11 km
- cloud free
- 15 mi spiral
- 1 hr window



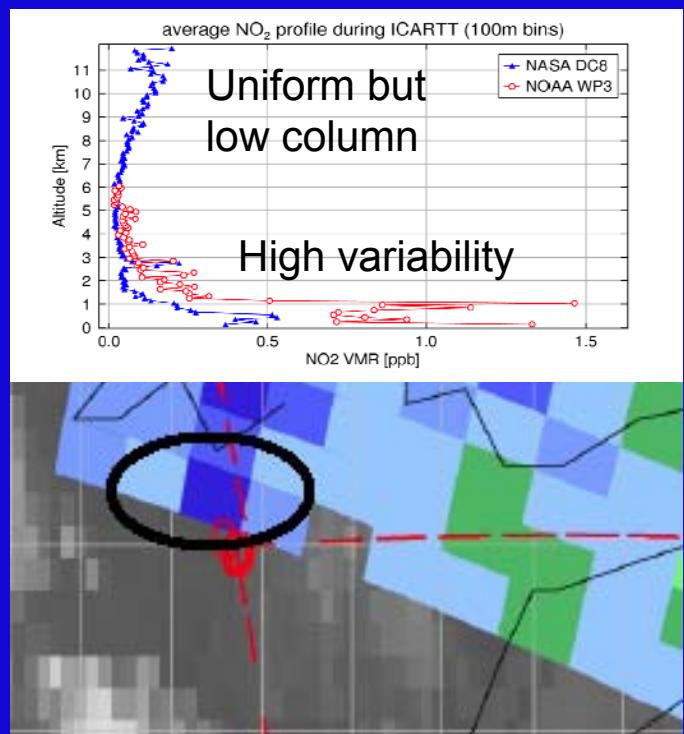
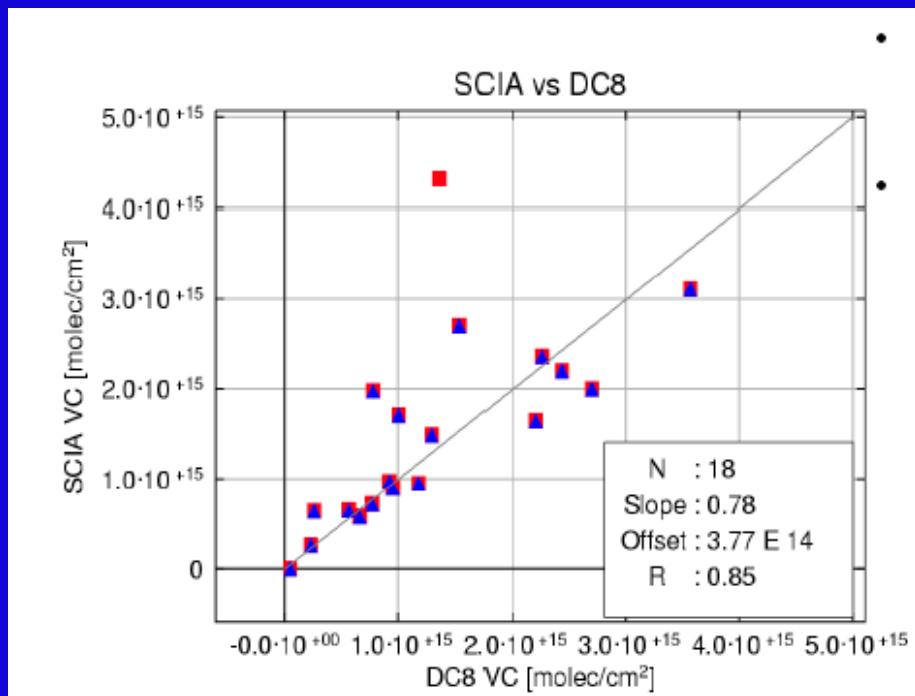
O₃ and Reactive Nitrogen vs models



Formaldehyde and isoprene



DC-8/SCIAMACHY Trop Column NO_2

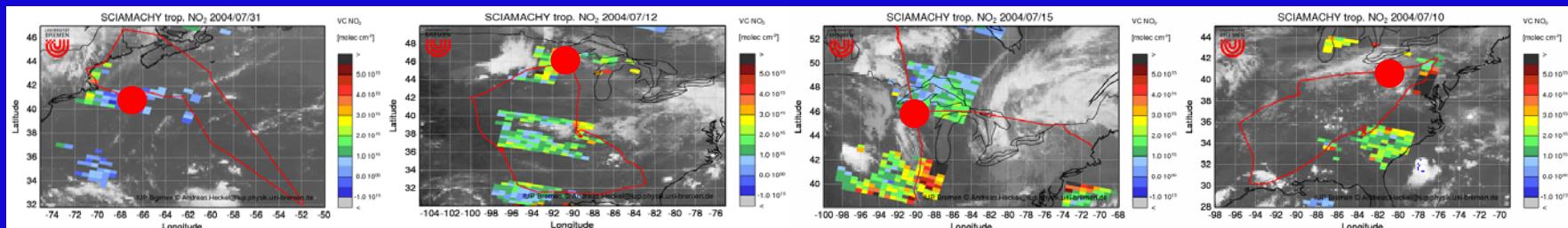


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7/12

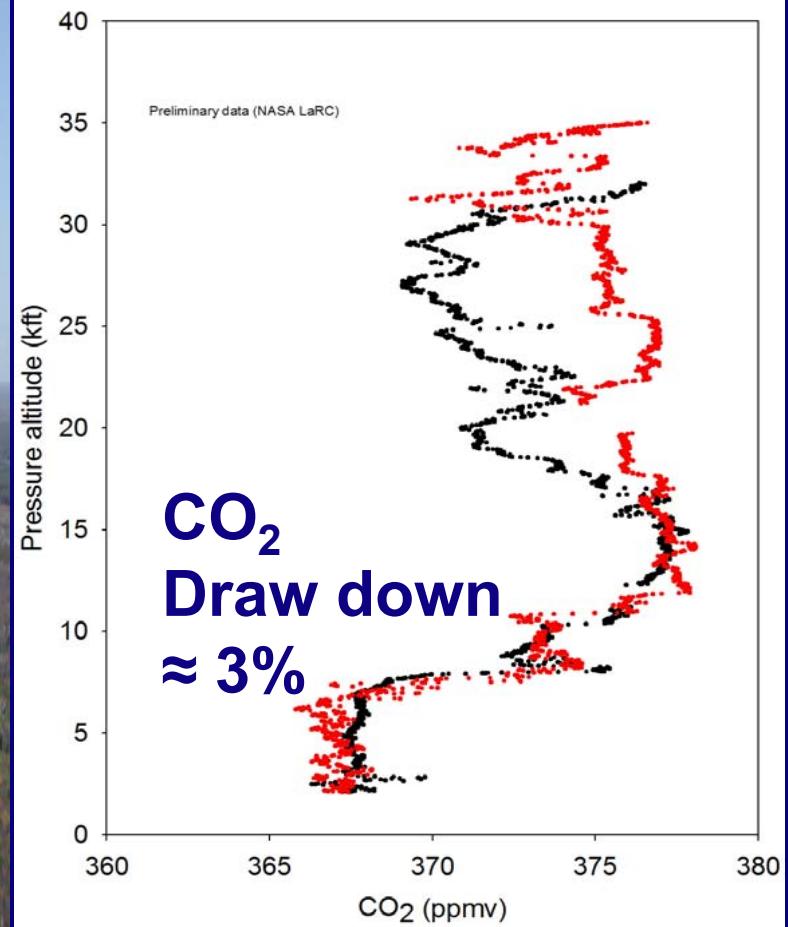
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7/10



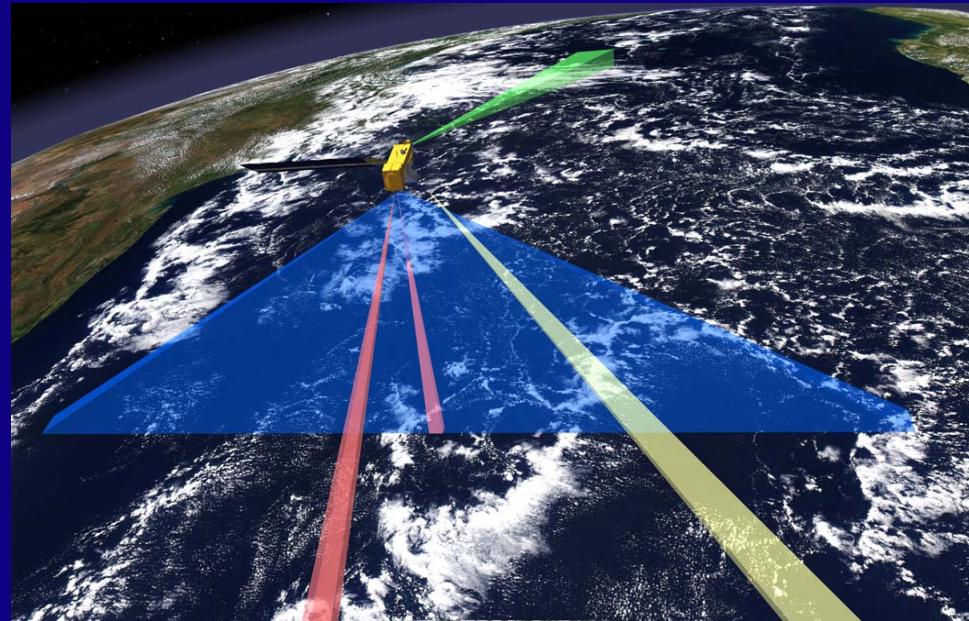
Heckel et al.

Carbon Cycle in INTEX-A



What we need from the Aura team?

- Satellite tracks and instrument swaths to be integrated with INTEX-B forecasts
- Definition of priorities
 - **Aura instruments?**
 - **along track vs column?**
 - **timed profiles?**
 - **strat/trop balance?**
 - **day/night?**
 - **other satellites?**
- Accommodation of requests from the INTEX-B team (TES step & stare?)



Falcon Payload



(0.1-13 km)

Nitrogen: NO, HNO₃, NO_y (DLR)

Carbon: CO, CO₂, CH₄ (MPI-C)

Oxidants: O₃ (DLR), RO₂ (Uni Bremen)

Sulphur: SO₂, H₂SO₄ (MPI-K)

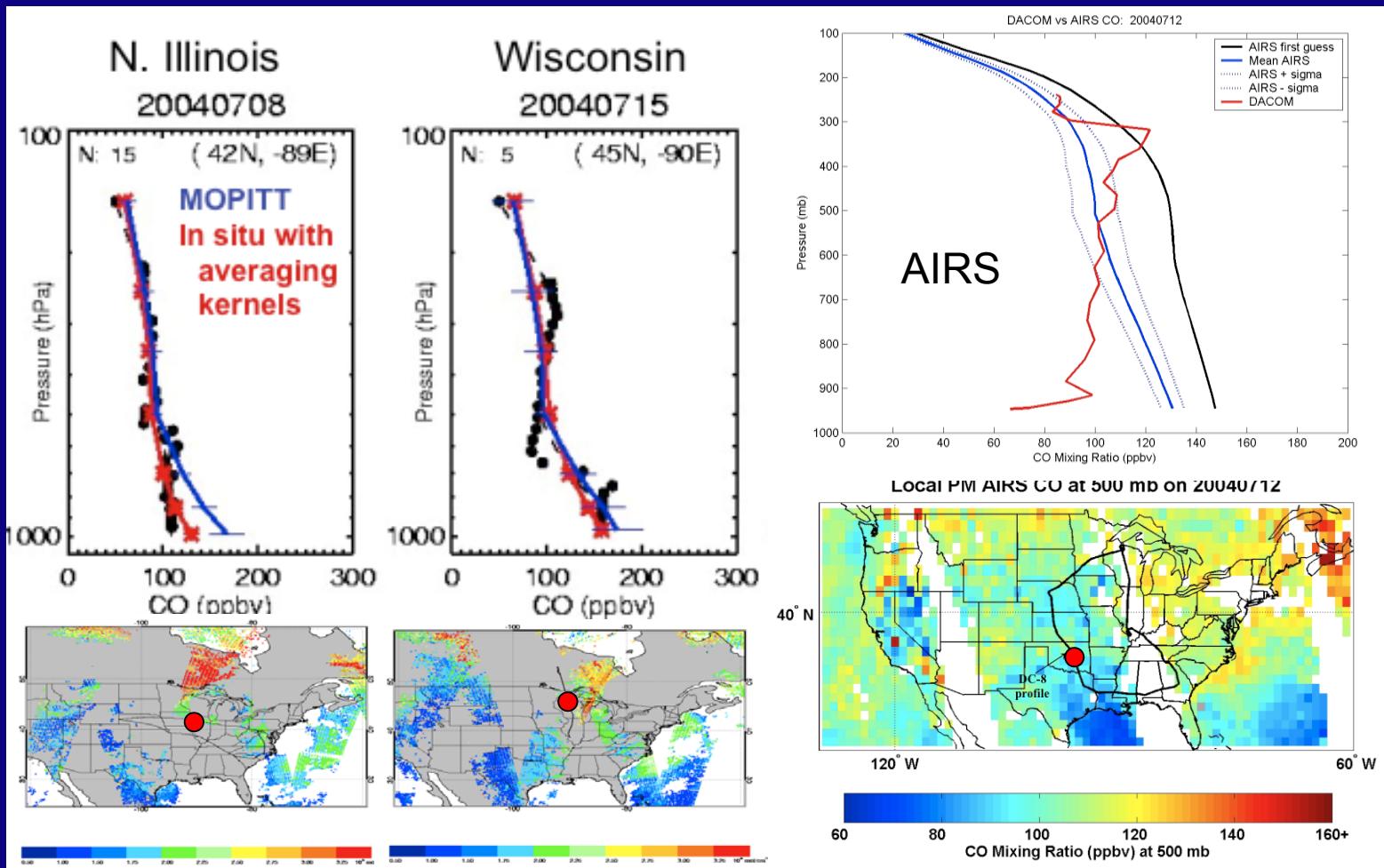
Black carbon (DLR)

Aerosol size (0.004 - 20 µm) (DLR)

Aerosol volatility (DLR)

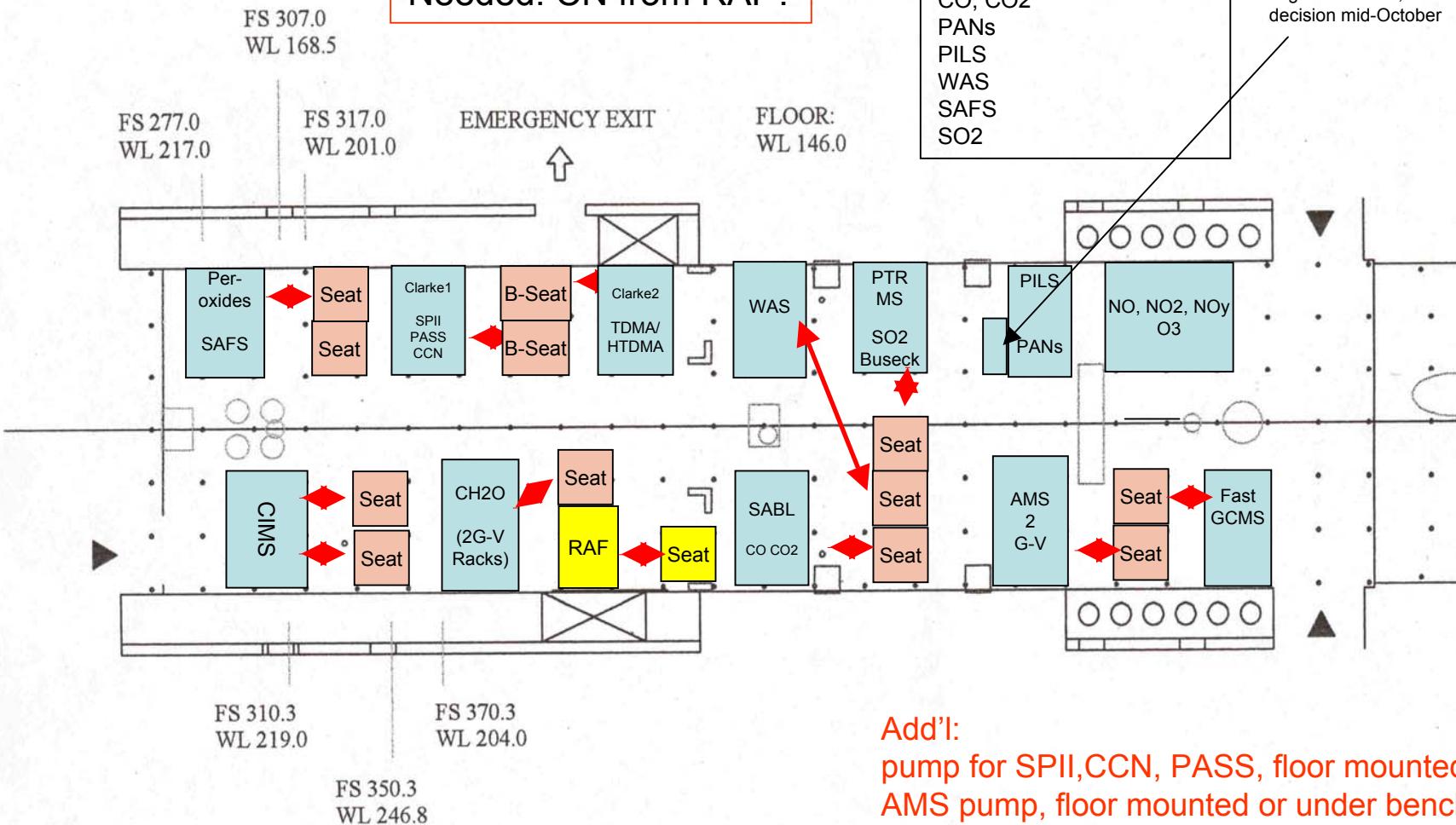
Chemical analysis of filter samples (Uni Munich)

DC-8/MOPITT, AIRS Trop CO



C-130 LAYOUT FOR MIRAGE

Needed: CN from RAF?



Add'l:
pump for SPII,CCN, PASS, floor mounted ?
AMS pump, floor mounted or under bench
seats ??